Recommendations to Implement a Potential Case Study Module to all CM Labs

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California Polytechnic State University, San Luis Obispo [Cal Poly for short] is notable for having one of the best undergraduate Construction Management programs in the nation. From winning consecutive regional competitions, such as the ASC Competition in Reno, to incorporating a "learn-by-doing" philosophy in all its classrooms, Cal Poly's CM curriculum truly distinguishes itself from other CM programs nationwide. From the Cal Poly Construction Management website, it's noted that upon graduation, "the department has virtually 100% placement in the construction industry" ("Cal Poly Construction Management"). However, while the CM program at Cal Poly truly excels in preparing its undergraduate students in technical skills, the curriculum lacks preparation for its students in another imperative industry skill: problem-solving. This report will evaluate the benefits of case-based learning, as adopted in the nation's top universities, such as Yale University, Harvard Business School, and Boston University. Moreover, the report will determine whether there is sufficient interest with implementing a potential case study module in all of Cal Poly's CM labs.

Keywords: Case-based Learning, Problem-solving Skills, Business-related skills, Construction Management, Evaluating Curriculum

Introduction

Cal Poly's Construction Management [CM] program is proficient in educating its students about the important materials used in construction, how systems are built, and the technology utilized in building programs. Some of the technical courses required by CM students include Soil Mechanics [CM 421], Engineering Surveying [BRAE 239], and Structures I & 2 [ARCE 211, ARCE 212]. Moreover, the CM curriculum attempts to cover a wide array of other topics related to construction and business, such as Business Law [BUS 207], Financial Accounting [BUS 212], and Microeconomics [ECON 221]. Within the realm of courses CM students take at Cal Poly, they learn a variety of skills, such as basic accounting, knowledge of the legal system, and knowledge about our economy.

While the CM flowchart does cover a variety of useful technical and management courses, there is a dearth of CM courses that can enhance the student's analytical and problem-solving skills. More specifically, there is a lack of understanding for how students can use their critical thinking skills (learned from support courses) and overlay them in relation to their field-specific laboratories, including Residential Lab [CM 214], Commercial Lab [CM 313], Heavy Civil Lab [CM 314], and Jobsite Lab [CM 413]. Respectively, I am proposing for Cal Poly's Construction Management program to consider incorporating a case study module to each of the major CM Laboratories.

According to Boston University's Center for Teaching & Learning, case studies are used in any discipline when educators want theirs students to see how real world applications align with classroom content ("Using Case Studies to Teach"). The way a professor assigns a case study can vary in different formats, from a simple scenario-type

question to a more detailed, complex analysis of the case. Furthermore, case studies can be discussed in an individual setting, in which the professor calls on the student to examine that student's point of view, or it can be discussed in a group-like setting, in which the professor divides the classroom into teams that promote group discussion. The decisions of how case studies are examined are made by the professor in a way that best accommodates the students.

Benefits of Case-based Learning

Case-based learning has been used in a number of different industries for a long time. In a faculty online forum for Yale University, one professor states that "CBL [short for Case-based learning] has a strong history of successful implementation in medical, law, and business schools. This method involves guided inquiry and is grounded with constructivism whereby students form new meanings by interacting with their knowledge and the environment" ("Yale Center"). Among the benefits of case-based learning are:

- Collaborative or Group Learning
- Self-Reflection
- Developing Analytical Skills

According to Addison Ferrell, a Harvard Business School alumni, learning from the case method approach was more meaningful because she had the privilege of learning from her classmates. Ferrell mentions, "My classmates offered perspectives from an incredible diversity of cultural, functional, and industry backgrounds in a way that a single professor could not" (Ferrell). Moreover, Ferrell conveys how the benefits of collaborative learning can help foster the strengthening of relationships among students in a classroom (Ferrell). Lastly, collaborative or group learning is unscripted, which means that students in a classroom can shape a discussion to what is considered important to them in the classroom. This characteristic drives an autonomous learning environment in which the students can greatly contribute what they'd like to share, rather than to follow a rigid learning schedule.

Another advantage of case-based learning is that it grants the student an opportunity for self discovery. As Ferrell mentions, "I learn to take a position and express my thoughts in a convincing manner" (Ferrell). The case method approach taught Addison how to quickly craft an argument and present her ideas in front of class. She recalled, "Although intimidating at first, practicing the skill of making impactful, succinct, and timely comments is highly rewarding [...] More important, I am confident that the communication skills I honed in class will serve me well wherever my career takes me" (Ferrell). In addition to self discovery, students can learn the important skill of improvisation before entering the workplace; by practicing case studies, students can learn how to think & respond to professional discussions in a timely, respectful manner.

Among the plethora of benefits that stem from case-based learning, perhaps the most significant skill that students can gain is enhancing their analytical capabilities. Analytical skills can be categorized as qualitative or quantitative; Examples include problem-detection, data-handling, and critical thinking skills (Singh). The ability to analyze is closely correlated with self-reflection because it requires a student to deeply think and consider different scenarios before forming a response. According to a journal evaluating the effectiveness of case-based learning, analytical skills are talents that a student can gain when the student "learns to classify, organize, and evaluate the information handled. Using this information, one attempts to understand the situation described" (Singh). Though the ability to analyze is extremely important, these skills are not innate. Rather, they are fostered through constant practice, which is why frequent exposure to case studies is the most advantageous way a student can improve their analytical skills.

Limitations of Case-based Learning

In addition to recognizing the benefits of case-based learning, teachers and students should also be aware of its drawbacks. An example of a drawback is that case studies are only applicable to specific subjects. For instance, it can be difficult for the teacher to find good case studies that are aligned with the particular subject matter being discussed at the time.

Moreover, case-based learning and its discussions are limited in that it discusesses only the observations of limited individuals. In a class where students aren't prepared to talk about the case study or where they have limited knowledge or experience with the case study assigned, it can be difficult for students to spark an insightful conversation.

Lastly, case studies are difficult for instructors to implement because they can be very time-consuming. With case-based learning, the role of an instructor is reversed; instead of the teacher being an educator, all students are given an opportunity to be an educator and share his/her like-minded insights with the class. In a course with limited class time, it's suggested that case studies are only assigned periodically to make the most use out of the time given.

The Possibility of Avoiding Such Limitations

When compared to the scope of benefits that case-based learning can offer to students, the drawbacks of this learning method seem trivial. As aforementioned, the three main disadvantages of case studies include limited subject material availability, potential of limited discussion capability, and the possibility of them being too time-consuming. These disadvantages can be entirely avoided if the professor chooses to shape the curriculum in a way to avert these hindrances. For example, the likelihood of professors finding limited subject material for construction-related cases is slim, because there is a plethora of construction-related literature content available. Moreover, the possibility of limited discussion capability can be prevented if the students are incentivized to participate in the case studies, particularly for points in a points-based grading system. Finally, the shortage-of-time aspect in case studies can be avoided if the professor puts an important emphasis on allocating enough discussion time for these debates.

Exposure of Case Studies in the Current CM Curriculum

Currently, in Cal Poly's Construction Management curriculum, there are two required CM courses in which students are periodically exposed to case studies. These courses include CM 334 [Construction Law] and CM 443 [Management of the Firm]. In these courses, students are given case studies to read over as homework assignments. CM 334 is a case-study heavy course; CM 443 is not as much.

In CM 334, the students evaluate case studies related to Construction Law. As homework assignments, students are required to read the case studies compiled in a textbook format, answer the textbook's questions, and discuss them in class. During class, students are grouped into teams. Each group has one member of the team discuss the assigned textbook questions. The group member that can give the "best" explanation of the assigned questions, in comparison to other teams, wins the argument and amounts for the most points of the day. The "best" answers are evaluated by the professor with good reason.

In CM 443, the students are assigned to read one case study per week as homework assignments. Students are required to answer a list of questions in relation to the case study. The case studies are rarely talked about in class, but if they are, they're talked about very briefly.

As depicted, other than CM 334 and CM 443, students have limited case-based learning in the current Construction Management curriculum. These two courses only account for five units in the 189-unit degree. To increase the students' exposure to case-based learning, I recommend for an adjustment in the current curriculum. My proposal is to implement a case-study module to all CM labs. This adjustment would not only increase the amount of case-based learning exposure to CM students, but it would also enhance the students' case study knowledge regarding the specific industry they're learning about. Moreover, students would gain collaborative, self-reflection, and analytical skills by their frequent exposure & practice with case studies.

Methodology

The primary goal of this report is to determine whether there's sufficient interest for CM students at Cal Poly to increase their level of exposure to case-based learning. If there is enough interest garnered by the students of the CM department, then creating a new case study module in the curriculum can be a consideration for the professors of this department. My methodology for examining case study interest in students is by sending out a survey-style evaluation on SurveyMonkey to all students in the CM department. The evaluation entailed multiple inquiries, including asking CM students:

1. Whether students would find value in taking a case study-related course
2. Whether there's sufficient case study learning in the current curriculum
3. How open they would be to having case-based learning modules introduced to their labs
4. How frequent they would like to evaluate case studies
5. What type of information they'd like to learn alongside the case study material

Analysis of Survey Results

In total, there were 42 responses from CM students. In regards to whether the students find value in taking a case study-related course, 10 out of 42 [23.8%] responded "Strongly Agree" and 27 out of 42 [64.3%] responded "Agree." When asked whether there is sufficient case study learning in the current CM curriculum, 19 out of 42 [45.2%] responded "Agree" while only 6 out of 42 [14.3%] responded "Disagree." This result indicates that construction management students at Cal Poly think they have sufficient case-based learning from taking merely CM 334 and CM 443. However, in the third question, when asked students how open they would be to additional case-based learning modules to their labs, 19 out of 42 [45.2%] agreed while only 8 out of 42 [19.1%] disagreed. This third question suggests that CM students at Cal Poly may be open to the idea of adding a case study module to each of the CM labs.

In addition to asking students regarding their current knowledge with case studies and their interest, the survey also consists of theoretical suggestions of how they'd like the course to run if this proposal was implemented. For instance, in a question asking how frequent students would like to review case studies, 19 out of 42 [45.2%] responded once every two weeks, 15 out of 42 [35.7%] responded once every week, and only 1 out of 42 [2.4%] responded twice a week. Furthermore, when asked students what they'd want the new case study module to be aligned with, 38 out of 42 [90.5%] responded they wanted to discuss case studies with their experience while only 3 out of 42 [7.1%] wanted to discuss them with textbook material.

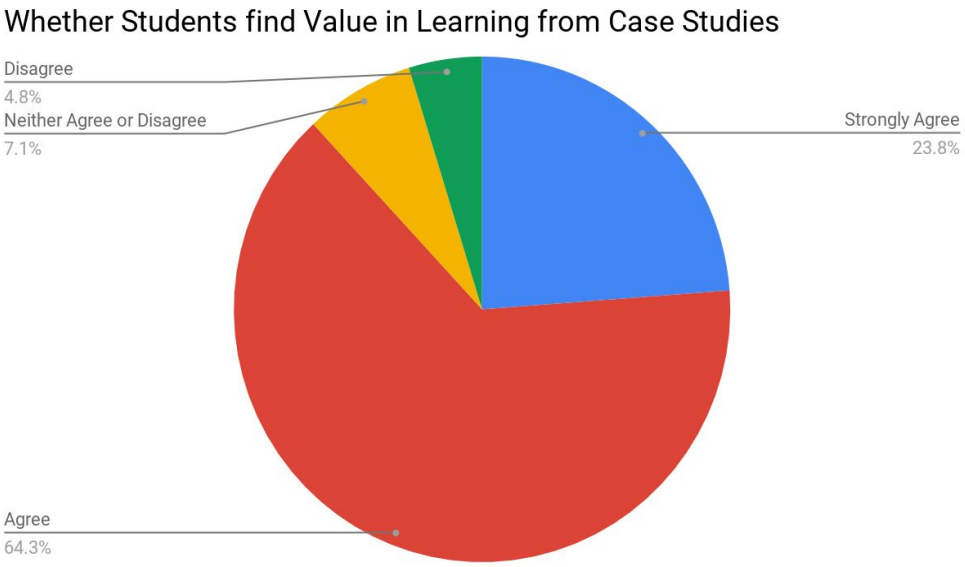

Figure 1 - Survey Question 1

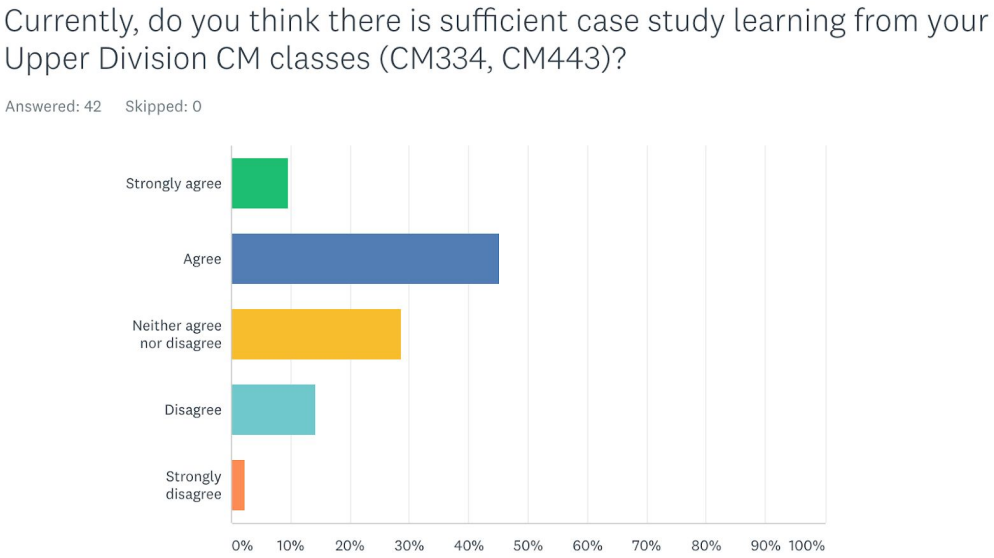

Figure 2 - Survey Question 2

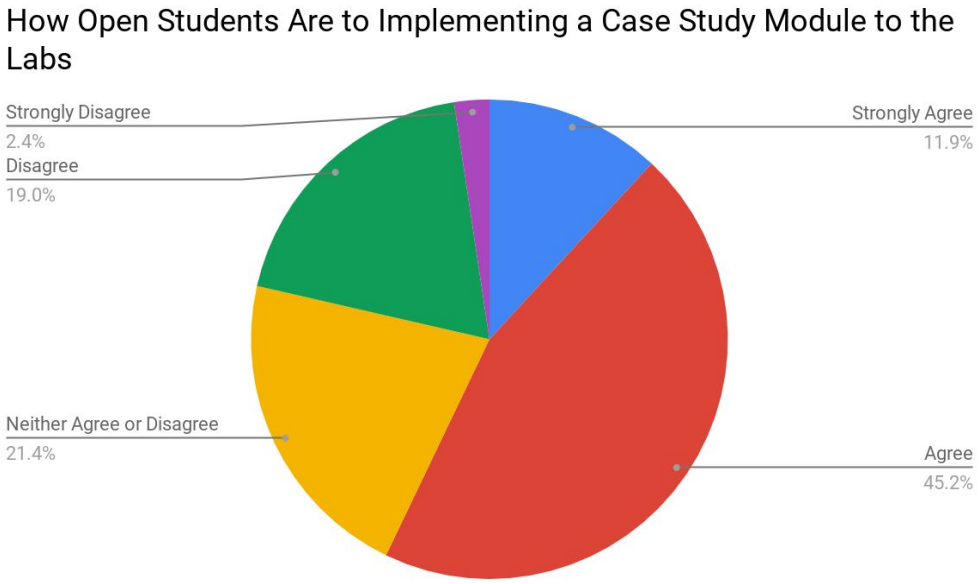

Figure 3 - Survey Question 3

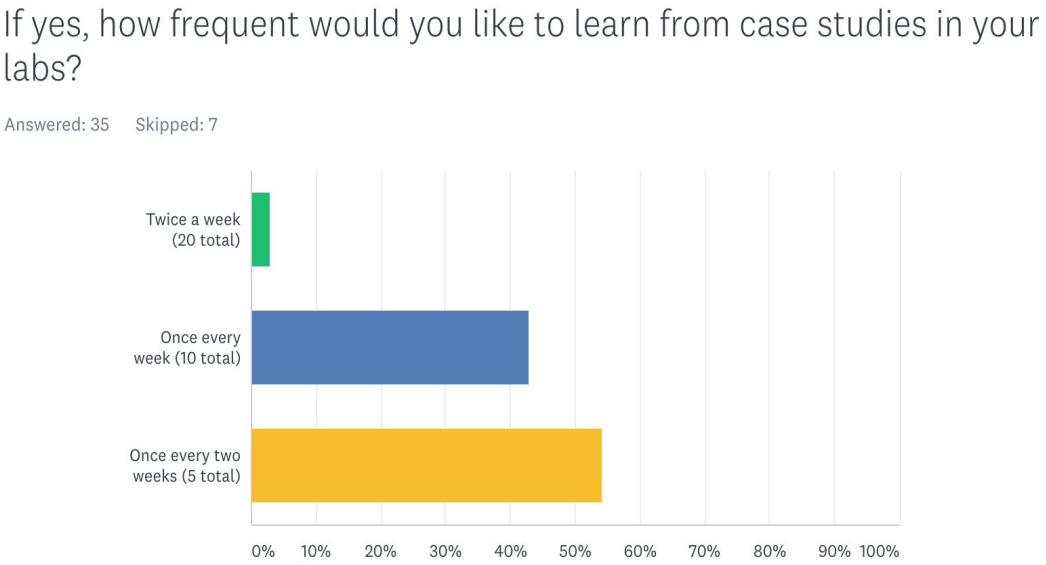

Figure 4 - Survey Question 4

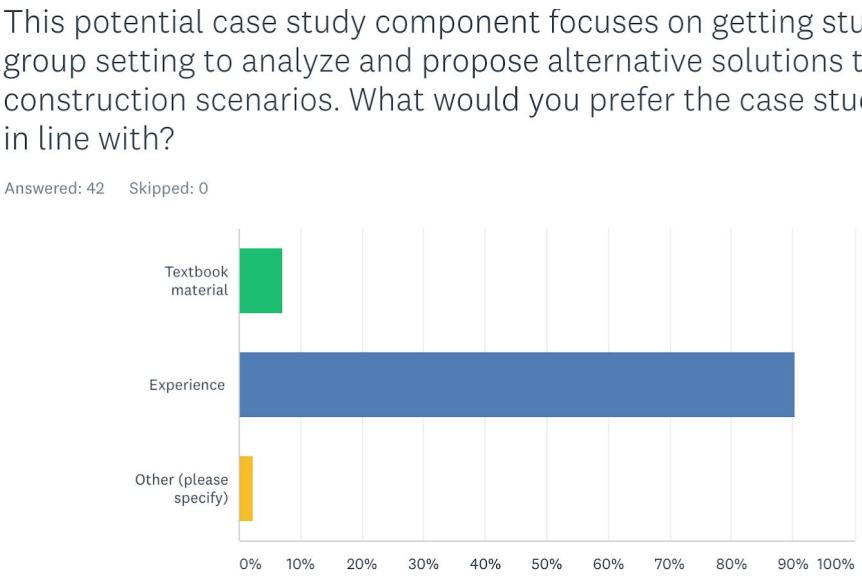

Figure 5 - Survey Question 6

Limitations of this Survey

There are several limitations to this survey. One limitation includes the sample size. In the survey I sent out through the department to all CM students, I only received 42 responses. Even though a greater number of responses would have been more effective in determining my results, I think the number I received [42] is still representative of the population I initially wanted to evaluate. Another limitation would be the quality of these responses. In Survey Question 4, when asked students how frequent they would like to learn from case studies respective to their labs, only 35 answered, which means that 7 people omitted the question. However, only a small amount of survey questions were omitted, and these missing answers do not deprive the authenticity of the survey's results. If I were to conduct this survey again, though, I would account for these limitations and amend my research method in a way that avoids these limitations. For instance, I would hand physical copies of the survey to CM students in each upper division lab, and I would discard the surveys of students who didn't answer fully.

Moreover, though shown in the appendix, I'm choosing to omit Question 5 of the survey because it's not in the scope of my research. Question 5 of the survey asks CM students whether they'd be open to the idea of taking a technical elective that focuses on case studies rather than having it be introduced in all CM labs. I believe replacing case study modules with a specific technical elective is not as effective as having it be introduced in all CM labs. Therefore, I am choosing to omit this survey question.

Conclusion and Recommendations

Overall, this survey garnered generally positive responses from CM students about implementing a case-based learning module to their respective labs. To summarize these results:

- 37 out of 42 students [88.1%] strongly agree or agree with the value of case-based learning
- 24 out of 42 students [57.1%] strongly agree or agree with adding a case study module to each of the CM labs

- If this proposal is made possible, 19 out of 42 students [45.2%] want to analyze a case study once every two weeks while 15 out of 42 students [35.7%] want to analyze a case study once a week
- 38 out of 42 students [90.4%] want to discuss potential case study material in line with their experience

Before I conclude this report, here is a list of recommendations I want the Construction Management department at Cal Poly to consider:

1. Start introducing case-based learning as one of the course objectives in all CM labs
2. Start a trial run of assigning a case study once every two weeks to see if there's actual student interest in case-based learning
3. Strongly consider aligning case study discussions with student experience

As aforementioned, the advantages of case-based learning is far greater than any impediments it can bring. The possible issues of unexciting student discussion and "waste of time" can be averted by careful implementation of the case study modules. If CM professors at Cal Poly can get through the hurdle of creating a comprehensive proposal to implement case-based learning in the labs, students can benefit by enhancing their group learning, self-reflection, and analytical skills. The CM industry [and the world as a whole] is getting more complex, as wealthy developers from countries abroad, such as China and the Middle East, are seeking to develop in the United States. Technical skills alone will not set students apart from one another. The communication and problem-solving skills, which students can benefit from case-based learning, however, will make them more well-rounded and help them to thrive in different types of situations.

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